



## **RECURRENT OR CHRONIC PNEUMONIA: DIFFERENTIAL DIAGNOSIS AND MANAGEMENT**

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### **I. INTRODUCTION**

**R**ecurrent respiratory diseases, with symptoms of cough and tachypnea whether or not in association with audible bronchial sounds, are common in children, especially those under 3. Because antibiotic use or other unnecessary therapeutic measures should be avoided, recurrent respiratory diseases should receive special attention during the acute phase before progression to pneumonia occurs.

As an orientation to diagnosis and treatment when an evaluation is performed of a patient who presents manifestations of an acute respiratory infection (ARI), consistent with underlying recurrent or chronic pneumonia, general guidelines are provided below that may be useful for the process.

### **II. DEFINITION**

The definition of recurrent pneumonia in children is controversial. For our purposes here, “recurrent pneumonia” refers to conditions in which respiratory symptoms occur more than twice in a period of six months, are more intense than a simple productive episode, and are accompanied by involvement of the pulmonary parenchyma as demonstrated by clinical and, ideally, through radiological findings.

Other, less precise definitions for recurrent pneumonia may be found in the medical literature. Generally, however, whether a case of recurrent pneumonia is identified will depend on the clinical expertise of the examiner.

In such situations, the difference is heightened between a focus on the diagnosis and treatment of ARI or acute pneumonia in children—a relatively simple process using broad strategies—and the case management of recurrent pneumonia. The latter requires individual analysis, expertise, up-to-date knowledge, and the availability of technological resources to ensure appropriate support for case evaluation and management.

### III. GUIDELINES FOR DIFFERENTIAL DIAGNOSIS: CLINICAL PRESENTATION

A thorough and accurate clinical history along with laboratory findings is essential for establishing differential diagnosis of recurrent pneumonia. For this purpose, a chest X-ray taken during inspiration and forced exhalation is the first and most helpful diagnostic tool.

The following information is relevant and required in evaluating the presence in patients of recurrent pneumonia:

- a) **Exacerbations and intercritical periods**, especially how asymptomatic the latter are;
- b) **Cough**, whether it is dry, productive, or dysphonic; whether it is accompanied by special, exacerbating or mitigating conditions; its characteristics since the onset of the disease;
- c) **First respiratory episode** that has concerned mother or caretaker; intensity of manifestations (symptoms and signs, duration, and treatment received); specific medical care required;
- d) **Neonatal respiratory involvement**, severity, course, and treatment received;
- e) **Otorhinolaryngological involvement**, presenting with concomitant nasal symptoms (sneezing, pruritus, or nasal obstruction, night rhonchi, suppurative and nonsuppurative otitis; signs of laryngeal involvement such as dysphonia, and stridor (severity, characteristics));
- f) **Characteristics of deglutition**, presence of respiratory symptoms during ingestion of liquid or solid foods; history of regurgitation including possible nasal regurgitation; history of spontaneous vomiting (e.g., frequency of vomiting episodes, stimulant factors);
- g) **Symptoms of food intolerance**, dyspepsia or flatulence; characteristics of abdominal pain, including its relation with types of food; stool characteristics, diarrhea or steatorrhea (fatty stools) among others;
- h) **Recurrent infections of other systems**, such as external otitis, perinasal infection, relation to skin infections;
- i) **Noninfectious involvement of the skin**, history of atopy, including allergy to certain types of food or insect bites; seborrheic dermatitis and atopic dermatitis, among others;
- j) **Choking due to ingestion** (accidental or oral introduction) of foreign bodies of any type of material;
- k) **Atopy or respiratory disease in household members**, either immediate or distant relatives, which information may help to diagnose diseases of genetic origin such as asthma, cystic fibrosis, ciliary motility disorders, and immune deficiencies, among others;
- l) **The environment of the child**, including the possibility of environmental contamination in the household or in the neighborhood that may relate to the current disease.

#### **IV. ETIOLOGY ACCORDING TO PREVALENCE**

According to clinical experience, the most frequent situations are the following:

- Sequelae of acute viral or bacterial ARI, especially when accompanied by atelectasis that fails to resolve properly;
- Aspiration pneumonia, including disturbances of deglutition, esophageal compression due to various causes, tracheoesophageal fistulas, and gastroesophageal reflux;
- Sequelae of neonatal respiratory disease;
- Environmental contamination, especially the household;
- Immunologic disturbances, especially those related to transient hypogammaglobulinemia of the infant;
- Congenital heart diseases;
- Severe asthma with productive manifestations;
- Pulmonary tuberculosis;
- History of suffocation due to prolonged stay of a foreign body in the airways;
- Cystic fibrosis or mucoviscidosis;
- Anomalies such as bronchomalacias and bronchial dyskinesia;
- Other conditions, including ciliary dyskinesia and infected congenital cysts.

#### **V. DIAGNOSTIC AND THERAPEUTIC GUIDELINES**

The following are guidelines for the diagnosis and management of the most common causes of recurrent or chronic pneumonia:

##### **a) Sequelae of prior ARI**

It is very important to collect precise information about previous acute respiratory infection, such as severity of breathing difficulty, signs of bronchial obstruction (including characteristics and amount of secretion), and prior therapy. Diagnosis requires ruling out similar pathological conditions characterized by hypersecretion, such as immune deficiency, diseases secondary to aspiration, cystic fibrosis, and changes in the tracheobronchial dynamics.

The management of the conditions mentioned above should include frequent and regular postural respiratory drainage to be performed by the mother or trained caretaker. Antibiotic therapy should be administered according to the presence or absence of bacterial infection. Bronchodilators (inhalants) may be used when a secondary reversible bronchial obstruction is present. The use of inhaled steroids is justified only if inflammation is associated, and the administration of cycles of oral steroids for different periods of time may be necessary.

Monitoring is critical to evaluate and control therapeutic response and to help alter therapy in these children.

**b) Aspiration pneumonias**

The clinical history is very helpful, particularly when information regarding characteristics of deglutition, cough, or signs of suffocation (during ingestion of liquids or solid food), and repetitive or spontaneous vomiting are present. It should be kept in mind that during the first two years of life, particularly during the first six months, vomiting secondary to paroxysmic cough occurs and is a positive indicator of gastroesophageal reflux. In addition, frequent regurgitation after meals is indicative of gastroesophageal reflux.

The symptoms of aspiration pneumonia may be the same as for recurrent pneumonia. The latter are frequently accompanied by signs of productive bronchial obstruction, and persistent cough with periods of exacerbation. In some patients, recurrent otitis is associated, partially caused by disturbances of deglutition and/or gastroesophageal reflux.

Different types of lesions may appear in the chest X-ray. Images of atelectasis are a diagnostic clue and may involve the posterior segment of the superior lobe of the right lung, the superior segment of the inferior lobe, the apical segment of the inferior lobe, the apical segment of the left superior lobe, and the inferior basal lobes. Radiological changes may also occur during the intercritical periods.

Radiological studies of the gastrointestinal tract, using barium to provide contrast, must be considered to evaluate the mechanism of deglutition, the esophageal morphology, and to detect the presence of esophageal strictures and the different degrees of gastroesophageal reflux. The functioning and duration of esophageal clearance after each episode of reflux should be taken into account. Complementary studies of the gastrointestinal tract using radioactive technetium may be performed to confirm more precisely the duration of each episode of reflux. Monitoring of intraesophageal pH under appropriate conditions may also be performed and is considered more sensitive and specific.

When changes in the mechanism of deglutition are mild, thickened liquid meals or finely minced food should be administered with a teaspoon or dropper. In severe cases, feeding through a nasogastric tube is appropriate if the disturbance is transient and reversible in a short period. Gastrostomy in association with antireflux surgery may be performed if the deglutition disturbance seems to be caused by a long-term process.

Cases secondary to gastroesophageal reflux require medical management only, except in those cases in which an associated severe neurologic disturbance results, which may require surgical treatment. The ingestion of liquids should be divided into extremely small quantities that will not cause the child to regurgitate or vomit. It is also recommended that the child's head and shoulders be kept at an angle of 30° (in relation to the horizontal plane), ideally face down, for at least one-half hour after the ingestion of liquids. Additionally, antacids or prokinetic agents such as metoclopramide and cisapride may be used. In special cases, the use of histamine H<sub>2</sub>-receptor antagonists such as ranitidine may be necessary.

The management of the respiratory component is based on maneuvers of postural bronchial drainage, particularly when bronchial productivity is associated, and the use of bronchodilators and cycles of steroids (e.g., beclomethasone) of different duration.

**c) Sequelae of respiratory disease in the newborn**

The diagnosis is based on a detailed clinical history which should precisely characterize the severity of the disease, how it was treated (administration and duration of treatment with amounts of oxygen inhaled), and justification for the use of mechanical ventilation and its clinical course and duration.

The conditions previously mentioned as sequelae of prior ARI should be ruled out. A good clinical history on the neonatal respiratory episode significantly contributes to the establishment of the diagnosis. Generally, management is similar to the one mentioned for sequelae of ARI.

**d) Environmental contamination**

Environmental contamination as a cause of recurrent pneumonia can be considered only when there is a prior significant household contamination such as seen with very poor families living under crowded conditions (e.g., food preparation in sleeping areas, use of contaminated materials such as charcoal, multiple organic detritus, or gasoline). Overcrowded living conditions and contamination are more serious if people live with domestic animals, the home contains dirt floors, and the sleeping area is not clean.

The presence of smokers in the home or exposure to an indoor source of smoke is also relevant. Thus, when open fireplaces are used for home heating, the intensity of air pollution increases with the frequency of use of the kitchens and the presence of organic substances in the type of fuel that is burned. Under ideal conditions the level of air pollution should be measured with equipment that determines the parts per million of the pollutant in the air being breathed.

The severity of the manifestations varies according to the degrees of contamination, exposure, and susceptibility of the patient. These factors determine how difficult the treatment may be. The clinical picture is a bronchial obstructive and hyperproductive type, and may require complete management. Cough is an important sign and has the following characteristics: dry, dysphonic, irritative; or in certain conditions, humid and productive. Episodes of pneumonia with recurrent parenchymal involvement resulting from the same contamination and physicochemical irritation to which the pulmonary tissue has been exposed are part of the clinical picture. Simultaneous bacterial infection may occur, partially due to changes in the mechanism of defense of the mucosa of the airways resulting from environmental contamination. High- and low-pitched crepitant rales associated with different grades of bronchial obstruction are heard during examination.

Chest X-ray shows peribronchial edema, different degrees of peripheral or central interstitial infiltrates; and in the maximum acute phase, parenchymal infiltrates revealed by X-ray to correspond to various degrees of pneumonia. The differential diagnosis should include the numerous chronic or recurrent conditions that take their course with similar manifestations.

Management should address control of the sources of environmental contamination, the use of bronchodilators and inhaled steroids, and if necessary, the administration of variable cycles of systemic steroids. Bronchial drainage is useful when a hyperproductive component is clearly present. Antibiotics are recommended when indicated due to an established bacterial infection.

**e) Immunological changes**

Immunological changes may occur when infections of other systems are present. The most frequent are otitis media, infections of the paranasal sinus, recurrent or prolonged diarrhea, and other serious signs of skin or mucosal infections.

Transient hypogammaglobulinemia of the infant is one of the most frequent immune disturbances in children and may manifest in episodes of recurrent and localized infections of the upper respiratory tract, in particular, otitis media and sinusitis. A number of cases also present episodes of recurrent pneumonia. The diagnosis is confirmed by measuring the levels of the immunoglobulins that are under the lower limits of normal, or a little below the lower limit. Two or three months after the first measurement, the immunoglobulin levels tend to rise. Patients should undergo cleaning of their nasopharyngeal region and receive antibiotics for bacterial infections during prolonged periods. The use of gammaglobulin should be avoided, because it may lead to suppression of normal production of immunoglobulins and interfere with the child's development.

A detailed description of the etiology, diagnosis, and treatment of immunodepressed and malnourished children with pneumonia is found in Chapter 15 of this publication. The management of such children is based on the evaluation of the current clinical manifestations and prior medical history of each case.

**f) Cardiopathies**

In patients with signs and symptoms suggestive of cardiac disease, it should be noted that cardiac involvement may result from dilation of cardiac chambers and hemodynamic changes caused by compression of central and peripheral airways. Atelectasis may be induced by compression of the airways, and infection may develop and manifest as recurrent pneumonia, almost always associated with signs of bronchial obstruction. The diagnosis can be confirmed with an echocardiogram and cardiac catheterization. Management goals include control of the hemodynamic changes and the productive component, which may be the source of the secondary bronchial obstruction.

**g) Severe asthma**

A small percentage of cases of asthma are frequently mistaken for pneumonia, because they manifest with obstructive episodes, mostly hyperproductive and associated with low-pitched crepitant rales. Under chest X-ray, different degrees of atelectasis are present and may be misdiagnosed as pneumonia. Only occasionally is the process due to bacterial superinfection. Besides the clinical history, studies should be performed to rule out other conditions, such as cystic fibrosis, deficits of IgA or IgG subclasses, alterations of the tracheobronchial dynamics, and aspiration pneumonia. The diagnosis of bronchial asthma may be easy if children are old enough to be submitted to spirometry or to a study of the curve of the respiratory flow/volume. In children under 5 years of age, however, this diagnosis is reached only after studies have ruled out the presence of the medical conditions already mentioned.

Management is the same as for a patient with severe asthma, and includes the administration of anti-inflammatory therapy with beclomethasone complemented with theophylline, for long periods; the use of  $\beta_2$  agonists ( $\beta$ -adrenergics) to be inhaled during periods of exacerbation and when exposure to inducing factors has occurred; respiratory physiotherapy specifically indicated; and in some cases, the use of oral steroids for variable periods of time.

#### **h) Pulmonary tuberculosis**

Clinical manifestations of pulmonary tuberculosis are less notable when compared with radiological changes. Generally, cough, variable degrees of respiratory difficulty, and general dysfunction of the patient's well-being are predominant signs or symptoms. Radiological findings guide diagnosis, which is to be complemented with epidemiologic data. The demonstration of bacilli in the sputum and culture growth of secretions confirm the diagnosis. (These samples are taken from the gastric aspirate over 3 consecutive days, from bronchial material either spontaneously exhaled or obtained through respiratory physiotherapy.) In certain cases, bronchoscopy with bronchoalveolar lavage is required to confirm the diagnosis. The therapy includes the administration of isoniazid and rifampicin 2 times per week over 4 months. This disease is addressed in more detail in Chapter 15.

#### **i) Foreign body in the airways**

A well-directed clinical history will frequently suggest or demonstrate suffocation caused by a foreign body. The diagnosis is confirmed by bronchoscopy. In cases where no relevant destruction of the bronchial structure is present, treatment includes the removal of the foreign body through bronchoscopy. Unfortunately, by the time the diagnosis is made, important lesions including saccular bronchiectasis are present, and pulmonary resections in the involved areas may be required.

#### **j) Cystic fibrosis**

Cystic fibrosis has to be considered in patients with recurrent signs of bronchial involvement, such as a predominant bronchial obstruction with hypersecretion, and an association with the intestinal malabsorption syndrome characterized by steatorrhea. Frequently, the child's skin presents a salty taste. The clinical picture is extremely diverse. Management should include daily respiratory physiotherapy, the use of antibiotics during the exacerbation periods, pancreatic enzymes, liposoluble vitamins, and optimal nutritional support.

#### **k) Bronchial anomalies and bronchial dyskinesia**

Bronchial anomalies and bronchial dyskinesia are possible causes of recurrent pneumonia, particularly when characterized by bronchial obstruction and localized and recurrent atelectasis, alternating with areas of pulmonary distension. Endoscopy is necessary for the diagnosis, which in special conditions may be confirmed by cinebronchoscopy. The management of cases of mild and moderate involvement includes respiratory physiotherapy and the administration of antibiotics for bacterial superinfection over variable periods of time. In severe cases, surgical

procedures are required to repair bronchial malacias. Other rare conditions such as ciliary dyskinesia and infected congenital cysts should be ruled out.

## VI. CONCLUSION

The differential diagnosis and management of recurrent pneumonia in children require a detailed and specialized individual analysis, which may become more complex depending on the severity of the disease. The primary goal of ARI programs for children does not intend to address specifically the morbidity and mortality attributed to these cases. However, it may contribute to their reduction, depending on the rational assignment of physical and human resources for the treatment of ARI and acute secondary pneumonia in children as well as the increase in the number of health care personnel with different levels of experience who can devote more time to these patients.

## VII. REFERENCES

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